REMARKS

The 11 March 2004 official action addressed claims 2-19. Claims 2-19 are canceled. New claims 20-31 are added.

<u>Overview of amendments</u>

The new claims focus on the embodiment of Figure 3, described at pages 20-26 of the application. This embodiment determines the distance to an object using at least two cameras, with one camera having a higher resolution (claims 20-22 and 26-28) or a smaller field of view (claims 23-25 and 29-31) than the other camera. In this embodiment, a set of samples is made from the image with the higher resolution or smaller field of view (p. 20, last paragraph; Figure 5). A set of distances is then calculated, each using one of the sampled images (p. 25, first paragraph). One of the distances is then selected using an appropriateness index associated with its corresponding sample (p. 25, second paragraph).

To describe the process of determining the distance to the object using the images, the term triangulation (p.2) has been eliminated in favor of a more detailed explanation. The cameras are now described as being spaced apart along a common baseline (p.2, lines 5-7), and the process is now described as calculating the distances based on the positions of the cameras (p.2, lines 19-20; p.3, lines 16-18) on the common baseline, the directions of the cameras (p.2, lines 20-21; p.3, lines 16-18) with respect to the common baseline, and the locations of a common point on the object in the respective images (p.3, lines 13-16).

Each set of claims includes a dependent claim specifying that the image having more pixels representing a unit area of object is interpolated before being sampled (p. 24, second paragraph).

Each set of claims further includes a dependent claim specifying that the index corresponding to a sampled image represents the difference between the values of corresponding pixels in the sampled image and the image from the other camera (p.25, second paragraph).

Claims 20-25 are method claims and claims 26-31 are apparatus claims that are analogous to the method claims.

No new matter is added.

Claim objections

The term triangulation has been eliminated from the claims in favor of a more detailed explanation drawn from the application as explained above.

Prior art rejections

All previous claims were rejected as being obvious in view of the combination of the admitted prior art, Subbarao (U.S. 4,965,840), and Auty (U.S. 5,809,161).

The features of the present claims are not found in the cited prior art.

The admitted prior art describes the conventional apparatus for determining the distance to an object by triangulation. The conventional apparatus uses two cameras spaced apart along a common baseline. After taking images of the object by both cameras from different viewing angles, the distance to the object is determined based on the positions of the cameras along the baseline, the directions of the cameras with respect to the baseline, and the positions of a common point of the object in each image. The admitted prior art lacks many features required by the claims. The admitted prior art does not use cameras having different resolutions or fields of view, does not form a set of sampled images from the image with the higher resolution or smaller field of view, does not determine respective distances using each of the images, and does not select one of those distances using an index representing the appropriateness of each distance.

Auty was discussed in detail in applicant's previous reply, and that discussion is incorporated herein by reference. Auty describes a vehicle monitoring system that uses two cameras having two different fields of view. Although Auty's system determines the distance to a vehicle, Auty does not determine the distance to the vehicle in the manner of the admitted prior art, namely, through a calculation based on the positions of the cameras along the

baseline, the directions of the cameras with respect to the baseline, and the positions of a common point of the object in each image. Rather, Auty tracks the location of an object using only one of the cameras. Therefore Auty's techniques are not relevant to determining distance in the manner of the admitted prior art, and so Auty provides no motivation to use cameras having different fields in the system of the admitted prior art. Auty also does not teach forming a set of sampled images from the image formed by the camera with the higher resolution or smaller field of view, does not determine respective distances using each of the sampled images, and does not select one of those distances using an index representing the appropriateness of each distance.

Subbarao teaches a system for determining the distance to an object. The system uses a single camera that make two images of the object using different camera parameters, or two cameras that make images of the object from the same viewing angle using different camera parameters. The system determines the distance to the object based on how much the appearance of the object changes as the result of a known change in the camera parameters. Subbarao's basic process is described in Figure 6. In this process, each image is scaled, a portion of each image containing a point on the object (subimage) is identified, and mathematical calculations are performed to determine "spread parameters" that represent how the 3D structure of the object is mapped onto the 2D image planes. The spread parameters are then compared to determine the distance to the object. The process of Figures 7a-7b uses the process of Figure 6 to produce a "depth map" for an entire object.

Subbarao does not determine the distance to the object in the manner of the admitted prior art, namely, through a calculation based on the positions of the cameras along the baseline, the directions of the cameras with respect to the baseline, and the positions of a common point of the object in each image. As noted in the official action, Subbarao's two camera system does not make images of the object from different viewing angles. Subbarao discusses sampling one of the images for the purpose of making its magnification equal to the magnification of the other image (col. 17, lines 8-41), however Subbarao does not generate multiple sampled images and then determine a set of

distances using each of the sampled images individually. Subbarao also does not calculate an index representing the appropriateness of each distance or select a distance based on its index.

Because of the differences pointed out above, the cited art does not teach the features presently claimed, and therefore all of the claims are patentably distinguished and allowable.

Respectfully submitted,

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